

1    WHAT IS CLAIMED IS:

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3        1. An optical switch array assembly comprising:  
4              a silicon substrate,  
5              an optical switch array disposed in the silicon substrate,  
6              a driving circuit integrated in the silicon substrate with the optical  
7              switch array and forcing the optical switches on and off, and  
8              a plurality of holes on the backside of the silicon substrate each  
9              aligned with an optical switch and guiding an optical beam to the optical switch.

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11        2. An optical switch array assembly of claim 1 further comprising an  
12              addressing circuit integrated in the silicon substrate with the optical switch array  
13              and locating each optical switch.

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15        3. An optical switch array assembly of claim 1 further comprising a glass  
16              plate mounted on the top of the silicon substrate.

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18        4. An optical switch array assembly of claim 1 further comprising a plurality  
19              of DNA probes disposed on the surface of the glass plate.

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21        5. An optical switch array assembly of claim 1 further comprising a plurality  
22              of hybridized DNA probes disposed on the surface of the glass plate.

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1       6. An optical switch array assembly according to claim 1, where said  
2       optical switches are Fabry-Perot cavity based optical switches.

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4       7. An optical switch array assembly according to claim 4, where  
5       said DNA probes are light-synthesized DNA probes.

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7       8. An optical switches array assembly according to claim 1, where  
8       said optical switches can be switched on and off for releasing and blocking  
9       said optical beams.

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11      9. An optical switch array assembly according to claim 4, where  
12       said light beams are directed to sites where said DNA probes are light-  
13       synthesized.

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15      10. An optical switch array assembly according to claim 5, where  
16       said light beams are directed to sites where said hybridized DNA probes  
17       are light-detected.

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19      11. A method of making an optical switch array assembly comprising  
20       the steps:

21            preparing a silicon substrate with a driving circuit and an  
22       addressing circuit fabricated based on a standard MOSFET process,  
23            depositing an anti-reflective layer on the surface of the silicon  
24       substrate,

1                   depositing a first mirror layer on the surface of the anti-reflective  
2                   layer,  
3                   depositing a sacrificial layer on the surface of the first mirror layer,  
4                   depositing a second mirror layer on the sacrificial layer,  
5                   forming a plurality of refilled trenches to define a plane  
6                   configuration for a Fabry-Perot cavity,  
7                   performing metallization to form electrical interconnections and  
8                   spacers,  
9                   performing deep etching to create holes on the backside of the  
10                  substrate, and  
11                  mounting a glass plate on the top of the substrate.

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13         12. A method of making an optical switch array assembly according to  
14         claim 11, further comprising a step for synthesizing a DNA probe array on  
15         said glass plate by light illumination.

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17         13. A method of making an optical switch array assembly, according to  
18         claim 11 where said anti-reflective layer is a silicon dioxide layer.

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20         14. A method of making an optical switch array assembly, according to  
21         claim 11 where said first mirror layer is an amorphous silicon carbide  
22         layer.

1       15. A method of making an optical switch array assembly, according to  
2       claim 11 where said first mirror layer is a silicon nitride layer.

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4       16. A method of making an optical switch array assembly, according to  
5       claim 11 where said sacrificial layer is a silicon dioxide layer.

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7       17. A method of making an optical switch array assembly, according to  
8       claim 11 where said sacrificial layer is an aluminum layer.

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10      18. A method of making an optical switch array assembly, according to  
11      claim 11 where said second mirror is an amorphous silicon carbide layer.

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13      19. A method of making an optical switch array assembly, according to  
14      claim 11 where said second mirror layer is a silicon nitride layer.

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16      20. A method of making an optical switch array assembly, according to  
17      claim 11 where said refilled trenches are filled with silicon dioxide.

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19      21. A method of making an optical switch array assembly, according to  
20      claim 11 where said refilled trenches are filled with an amorphous silicon-  
21      silicon dioxide-amorphous silicon sandwiched plug.

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1       22. A method of making an optical switch array assembly, according to  
2       claim 11 where said refilled trenches are filled with an amorphous silicon-silicon  
3       dioxide-amorphous silicon sandwiched plug.

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